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laid is moving the decimal point till it stands directly after the first significant figure. Thus $850.72 = 8.5072 \cdot 10^2$; $0.000652 = 6.52 \cdot 10^{-4}$.

We cannot go into details, but may say that Prof. Holman's rules are few and simple, and so abundantly illustrated that students will find little difficulty in applying them. The book is probably the best, in its particular field, which is available for American students and engineers. When five-place tables are not sufficiently accurate the author recommends the well-known Vega or other seven-place tables. It is a pity that engineers and others seem to be unaware that Bremiker's six-place tables, revised by Albrecht, are sufficiently accurate for almost any problem which occurs in practice, and are easier to use than any seven-place tables.

A few peculiarities of Prof. Holman's book deserve notice. Negative characteristics are used, even in the tables, and recommended. Decimal points are introduced in the arguments of the tables of logarithms of natural numbers; instead of 621, 6.21 is printed. Interpolation tables are not given for all the tabular differences on a given page, when the differences are large, even though there is ample room on the margin of the page. The interpolation tables given are not accurate. Thus $0.3 \cdot 22$ is called 7 instead of 6.6; this suffices in multiplying by one figure, but in division needless inaccuracy may arise.

In the table of 5-place logarithmic trigonometric functions the argument is for each minute, but no proportional parts are given. There is no provision for finding accurately the logarithmic sines and tangents of small angles involving fractional parts of a minute.

A student will sometimes wish that the author had been a little more particular in his statements. On page xii., for example, after stating two fundamental propositions, "which one can easily verify by algebra or by numerical examples," the author adds:

"A more general form of statement from which these follow is: If several numbers are multiplied or divided, a given percentage error in any one of them will produce the same percentage error in the result." Take the example $\frac{1}{2} \cdot 2 = 60$. The student will think that the author means that if the divisor 2 be in error

by 25% of itself, the quotient is in error by 25% of itself. This he will find to be false. Had the author given a definition of 'percentage error,' the student would be able to determine whether the above statement were exact, or simply approximately true for such examples as are likely to occur in practice. The two propositions mentioned above might be improved by re-writing.

Two errata have been noticed: In the first line of p. xxiii for 'numerator' read 'denominator'; in the last line of p. xii for 'merely' read 'nearly.'

The book is elegantly printed on heavy paper; one can only wish that it were so bound that it would lie open with a flat page, a *sine qua non* of logarithmic tables.

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SCIENTIFIC JOURNALS.

AMERICAN JOURNAL OF SCIENCE.

THE subject of the Röntgen rays is discussed in the *March number* by A. A. Michelson, who proposes a new hypothesis to account for the phenomena observed. He mentions, first, the two theories that have hitherto been suggested, that of longitudinal waves and that of projected particles, and remarks upon the special difficulties which each of these theories meets. His own hypothesis he calls the 'Ether-Vortex' theory, which he states as follows:

"Let it be supposed that the X-rays are vortices of an intermolecular medium (provisionally, the ether). These vortices are produced at the surface of the cathode by the negative charge, which forces them out from among the molecules of the cathode." He shows that certain of the phenomena which are most typical and difficult to explain may be accounted for on this supposition. The fact that a high vacuum is essential within the tube while, once outside, the rays can pass not only through air, but also through many solids, is regarded as finding a solution if it be considered that, in order that ether vortices may result from the electrical impulse, this impulse must be communicated to them, and must not be dissipated in the interchange of molecular charges which

accompanies, or rather produces, the discharge at moderate or high pressures. At the high exhaustion the energy of the discharge would be largely confined to the ether vortices. The absence of the ordinary light phenomena of reflection, etc., would follow from the nature of vortices.

The first article of the number is by C. E. Beecher, on the 'Morphology of *Triarthrus*.' This is a continuation and an extension of earlier articles by the same author upon the structure of *Trilobites*. The results given are presented on a plate showing the dorsal and ventral views of the species, *Triarthrus Becki*. These have been made from drawings based, the first upon three specimens, and the second upon two, all in a very exceptional state of preservation. The perfection with which the appendages of the trilobite are preserved and the life-like position in which they are shown is most remarkable. The author is enabled to draw from them definite conclusions in regard to the relations and functions of these organs of which so little has been known hitherto.

A. E. Ortmann discusses the subject of the existence of climatic zones in Jurassic times, with special reference to the arguments for them given by Neumayr. He contends strongly against Neumayr's views and states his conclusion finally that the differences observed in the faunas of the Jurassic deposits are not caused by climatic differences. J. E. Wolff describes an occurrence of the rare rock, theralite, from Costa Rica, from specimens collected by Prof. R. T. Hill. The rock bears a close similarity to the original type from Montana. The possible existence of a zone of alkaline rocks continuing from the northwestern United States on the east border of the Rocky Mountains is suggested. C. H. Smyth, Jr., describes in detail an occurrence of gabbro and associated gneiss near Russell, St. Lawrence county, N. Y. The gneiss is regarded as derived by the metamorphism of the gabbro resulting finally in entire re-crystallization and the removal of all cataclastic structure. Another extended petrological paper is by W. H. Weed and L. V. Pirsson, forming the first part of a memoir upon the Bearpaw Mountains, in Montana. This is a region which has been hitherto

but little investigated geologically. After a brief statement of the general geology, the relation of the sedimentary rocks, largely Cretaceous, to the massive, igneous rocks and tuffs, the authors go on to describe more particularly the igneous rocks, including both the effusive and intrusive forms. The former are most abundant, forming the highest peaks and many of the lesser summits of the region; they are the usual rocks of the foot hills, embracing dark-colored basaltic tuffs, breccias and lava flows, which are parts of the former volcanic cones. They consist largely of lencite basalts. The intrusive rocks described include various forms of trachyte and quartz-syenite porphyry; also associated with the syenite, the rock shonkinitic, a type described by the same authors from Yogo Peak, Montana. H. B. Bashore gives some notes on glacial gravel in the lower Susquehanna. Robert Chalmers describes the Pleistocene marine shorelines on the south side of the St. Lawrence Valley, connecting them with the terraces noted farther west along Lake Ontario. The occurrence of free gold scattered in scales through the quartz and feldspar of a granite-like rock from Sonora, Mexico, is described by G. P. Merrill. He shows that the gold cannot be regarded as of secondary origin, assuming that the rock is a normal granite, the occurrence is novel and of decided importance. The number concludes with a series of abstracts, book notices, etc.

AMERICAN CHEMICAL JOURNAL, MARCH.

The Molecular Weight of Sulphur. By W. R. ORNDORFF and G. L. TERRASSE.

In the course of an investigation on the molecular weight of monoclinic sulphur some remarkable results were obtained. Although both the boiling-point and freezing-point methods were used, the results from the latter were not concordant and no conclusions can be drawn from them. The results obtained by the other method are as follows:

1. The molecular weight of sulphur in liquids whose boiling-points are below the melting-point of sulphur, as for example, benzene and toluene, is represented by S_8 .

2. In liquids boiling above the melting point of sulphur, the molecular formula is S_8 .

3. In sulphur chloride the sulphur is apparently dissociated to the same extent as in the vapor at high temperatures, the molecular complexity being represented by S_2 .

On the Determination of Sulphur in Illuminating Gas and in Coal. By CHARLES F. MABERY.

The author uses a modification of Sauer's method, burning the gas in a tube in a stream of air, the products formed being absorbed in a standard alkaline solution. The coal is burned in the same way, being introduced into the tube in a platinum boat. The amount of sulphur left in the ash is less than 0.05 per cent. on an average.

Chemistry of the Berea Grit Petroleum. By CHARLES F. MABERY and O. C. DUNN.

A brief account is given of the most important wells and their output, and the character and properties of the petroleum from the Berea Grit.

A Method for the Standardization of Potassium Permanganate and Sulphuric acid. By H. N. MORSE and A. D. CHAMBERS.

If a known quantity of standard sulphuric acid is treated with hydrogen peroxide and potassium permanganate added as long as the color disappears, and more hydrogen peroxide and permanganate added until most of the acid has been used up, and the excess determined by titration with the standard ammonia solution, the strength of the permanganate can be easily calculated.

Some derivatives of unsymmetrical Tribrombenzol.

By C. LORING JACKSON and F. B. GALLIVAN.

The authors find that two of the bromine atoms in tribromdinitrobenzol are easily replaced by treating with aniline or sodic ethylate. A number of derivatives are described.

Besides a review of recent work on Helium, and notes on the composition of Barium Picrate, and the proposed changes in the *Berichte* and '*Beilstein*,' this number contains reviews of the following books:

'Kurzes Handbuch der Kohlenhydrate,' Dr. B. Tollens; 'Die Chemie der Zuckerarten,' Dr. E. O. von Lippmann; 'Ostwald's Klassiker, Zur Entdeckung des Elektromagnetismus,' and 'Die Anfänge des natürlichen Systemes der chemischen Elemente,' 'Die Lehre von der

Elektrizität,' G. Wiedemann; 'Physikalisch-chemische Propädeutik,' H. Griesbach; 'A Laboratory Manual of Organic Chemistry,' Dr. Lassar-Cohn; 'Jahrbuch der Elektrochemie,' 'Anleitung zur Molekular-gewichtsbestimmung nach der Beckmannschen Gefrier- und Siedepunkts-Methode,' Dr. G. Fuchs; 'Einführung in die mathematische Behandlung der Naturwissenschaften,' W. Nernst; 'Elements of Modern Chemistry,' C. A. Wurtz.

J. ELLIOTT GILPIN.

PSYCHE, APRIL.

S. H. SCUDDER gives a table to separate the 13 New England species of Melanopli, 10 of them belonging to the genus Melanoplus; H. F. Wickham continues former studies on myrmecophilous Coleoptera; and a notice is added of Plateau's recent experiments on insect vision. A Supplement contains the conclusion of C. F. Baker's account of some new New Mexican Homoptera and the beginning of descriptions of new species of bees of the genus Prosopis (or Prosapis, as the author prefers), by T. D. A. Cockerell.

SOCIETIES AND ACADEMIES.

NEW YORK ACADEMY OF SCIENCES.

At the meeting of the Biological Section, on March 9th, 1896, Mr. F. B. Sumner read a paper on 'The Descent Tree of the Variations of a Land Snail from the Philippines,' illustrated by a lantern slide. Mr. Sumner described the range in variation in size and markings in the shell, and arranged the varieties in the form of a tree of three branches diverging from the most generalized type. It was shown that these several varieties occupy the same geographical region, and Mr. Sumner was of the opinion that their occurrence could not be explained by natural selection since if the colorations were supposed to be protective it would be impossible to explain the evolution of these three types. Prof. Osborn, in discussion, was inclined to take the same view. Dr. Dyar, however, thought the explanation by natural selection not necessarily excluded, since the variations seemed analogous to the dimorphism in sphinx larvæ, which has been shown by Poulton to be probably due to this factor.